

Definition: **Carrel, Alexis** from *The Hutchinson Unabridged Encyclopedia with Atlas and Weather Guide*
French-born US surgeon who was awarded a Nobel Prize for Physiology or Medicine in 1912 for his work on the techniques for connecting severed blood vessels and for transplanting organs. Working at the Rockefeller Institute, New York City, he devised a way of joining blood vessels end to end (anastomosing). This was a key move in the development of transplant surgery, as was his work on keeping organs viable outside the body.

Summary Article: **Carrel, Alexis**

From *Encyclopedia of Life Sciences*

abstract

(1873-1944) French surgeon who successfully joined blood vessels by end-to-end anastomosis with triangulation sutures, thereby permitting the rapid reestablishment of blood circulation to a transplanted organ.

keywords

vascular anastomosis

organ transplantation

tissue culture

carrel flask

Alexis Carrel was born in 1873 in Sainte-Foy near Lyon, France. In 1900 he graduated Doctor of Medicine at Lyon and in 1904 departed for America to work in the Physiology Department at the University of Chicago. He joined the Rockefeller Institute for Medical Research in New York City in 1906 as an associate member, achieving full membership in 1912.

Becoming interested in the tissue culture technique devised by Yale University researcher Ross G. Harrison, Carrel sent his colleague M. T. Burrows to learn the technique from Harrison. Their aim was to grow cells from warm-blooded animals, although this had already been accomplished in 1908 by Margaret Reid in Berlin. Carrel and Burrows claimed to have devised a method that employed a simple surgical technique, freshly sterilized glassware and instruments. In fact, they transformed the simple technology of tissue culture into an elaborate laboratory ritual. Carrel and Burrows worked in two separate suites of rooms consisting of animal preparation rooms, scrub room and culture/operating room fitted with built-in sprays to deal with the problem of dust. Carrel required technicians, including Charles Lindbergh of subsequent aviation fame, to dress somewhat theatrically in black full-length gowns fitted with hoods. **See also:** Harrison, Ross Granville; Cell Culture: Basic Procedures; HistoCultures and Organ Cultures

Carrel's view that 'the technique (of tissue culture) is delicate and in untrained hands, the experimental errors are of such magnitude as to render the results worthless' caused other investigators to shy away from research involving tissue culture because of its apparent complexity, the cost of laboratory equipment and space. Critics termed this Carrel's 'mumbo-jumbo', and claimed that it stalled medical

progress for years. **See also:** Safety Considerations in the Tissue Culture Laboratory

He developed the technique of end-to-end anastomosis of blood vessels in 1902. This technical advance permitted him to transplant organs successfully 6 years later. Continuing the work on organ transplantation begun by Emerich Ullmann in Vienna, Alexis Carrel became the first researcher in the USA to win the Nobel Prize in Medicine or Physiology by devising a skilful technique of approximating the ends of blood vessels to be anastomosed through triangulation sutures. He also successfully perfected surgical techniques to suture small vessels. In 1905, together with his colleague, Charles Guthrie, Carrel successfully performed a kidney autotransplant in a dog (though the animal died after the kidney failed). **See also:** Transplantation

He demonstrated that blood vessels could be maintained in the cold for 'prolonged periods' before using them for transplantation. Carrel and Burrows used Harrison's technique to grow sarcoma cells in culture in 1910. Together with T. Tuffier, Carrel performed a number of successful experimental valvotomies. In World War I, he and H. D. Dakin developed a treatment for wounds that was used extensively.

A positive accomplishment in his tissue culture research was the 'Carrel flask' which reduced the bacterial contamination that had been a principal cause for failure of tissue cultures before the discovery of antibiotics in the 1940s. He also claimed to have developed an immortal cell line of chick embryo heart cultures that was begun in 1912 and supposedly maintained by him and a colleague, A. H. Ebeling, until 1942. How this was accomplished remains an enigma, as cells are now known to have a finite longevity.

In 1938, Carrel retired from the Rockefeller Institute and returned to France, where he set up an Institute for the Study of Human Problems in Paris. The Vichy French Government assisted him during World War II and he negotiated with the Germans. In August 1944, following the liberation, Carrel was accused of collaborating with the enemy but died before he could be arrested.

Further Reading

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